



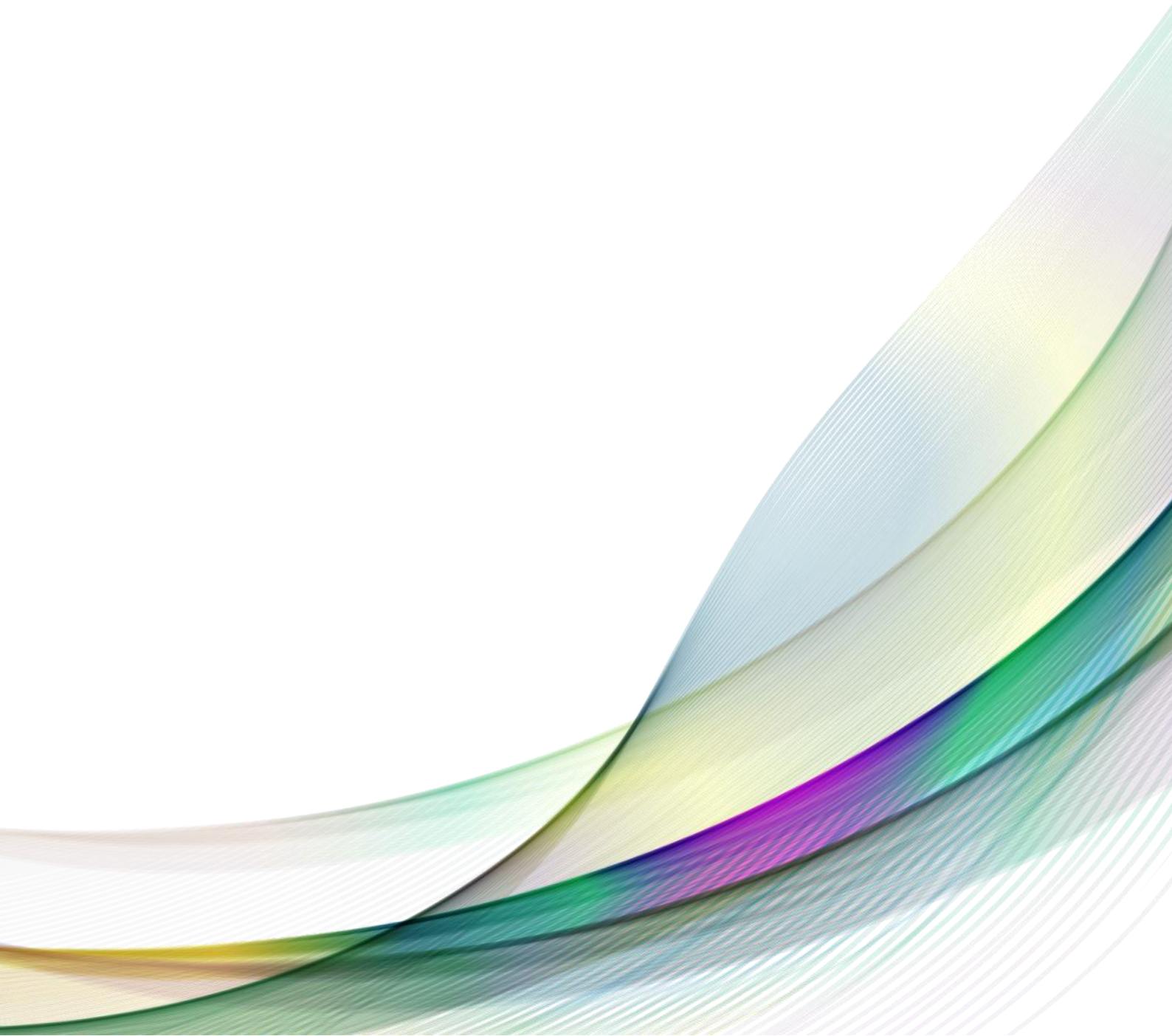
MACH
GROUP

THINKING DIFFERENTLY

BRUCE GROVE YOUTH SPACE

Plant Noise Impact Assessment

Pulse Consult



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1.0 INTRODUCTION

MACH has been appointed by Pulse Consult to undertake a noise impact assessment at the proposed site of Bruce Grove Youth Space in the London Borough of Haringey.

The development is a Youth Centre building which includes two stories. This impact assessment undertaken is required to assist with the following:

- Determine appropriate background noise levels representative of nearby noise sensitive receivers appropriate for a BS 4142:2014 plant noise impact assessment.
- Assess the noise impact of the proposed mechanical plant equipment at the nearby noise sensitive receivers.

Details of the noise survey which facilitated this assessment is presented within APPENDIX A

2.0 SITE DESCRIPTION

The proposed development is located on Bruce Grove. The surrounding buildings include residential dwellings to the north and a range of occupied buildings to the south, which are assumed to include further residential dwellings.

The site in relation to its surroundings and nearby noise sensitive receivers is presented in Figure 2.1.



Figure 2.1: Worst-affected noise sensitive receivers

2.1 Noise Sensitive Receivers

Locations that are noise sensitive receivers (NSR), which will be assessed within this exercise are listed below.

NSR Reference	Location	Type	Distance to Plant Installation (m)
NSR.1	Woodside Gardens	Residential windows	16
NSR.2	Bruce Grove	Healthcare Building Windows	4

Table 2.1: Worst-affected noise sensitive receivers

3.0 EXISTING BACKGROUND NOISE LEVELS

To establish the existing background noise levels on site, a noise survey was conducted between 12:40 on the 25/08/2022 and 12:40 on the 26/08/2022 by Chase Bartlett and in accordance with BS 7445-1: 2003. More information on the methodology of this survey, site information and survey data, is presented in APPENDIX A.

When considering the existing background levels of a site, BS 4142:2014, "Methods for Rating and Assessing Industrial and Commercial Sound" states that the background sound level used for the assessment should be representative of the period being assessed.

BS4142:2014 goes on to state:

"To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

The table below presents measured noise levels of the $L_{A90,T}$ values measured on site. For the purpose of this assessment, the most commonly occurring $L_{A90,5\text{minute}}$ was considered representative of the existing background noise level on site, in line with the requirements of the Local Authority. The histograms showing the distribution of the $L_{A90,5\text{minute}}$ are shown in APPENDIX B.

Measurement Position	$L_{A90,T}$ Method	Background Noise Level $L_{A90,T}$	
		Daytime (07:00 – 23:00)	Night Time (23:00 – 07:00)
Fix position	Mode	38	30

Table 3.1: $L_{A90,T}$ background noise levels for plant noise break-out assessment

4.0 ASSESSMENT CRITERIA

4.1 Design Target

MACH understands the London Planning Policy usually determines the noise rating target should be set 10 dB below the existing back noise level $L_{A90,T}$.

The proposed development is a refurbishment project, where the proposed plant are upgrades, replacements or are supplementary to the existing equipment to maintain the operation of the building, with no material change of use.

The mitigation required to achieve a rating level of ≤ 28 dB (10 dB below the daytime $L_{A90,T}$ level of 38 dB) is considered unfeasible. Therefore for the reasons detailed above, MACH feel it is appropriate to assess against a target of equal to the existing background target. As the noise survey was conducted when the site was operational, designing to equal to (or below) the measured levels ensure the noise from the proposed plant is consistent with the existing case and that there will be no increase in noise levels associated with plant and thus no detrimental impact on nearby noise sensitive receivers.

Note, this target is subject to agreement with the local authority.

Noise rating levels are to be assessed against the existing background noise levels, $L_{A90,T}$. For the purposes of assessment, MACH Acoustics has used the modal daytime and night-time background noise level.

As per above, a plant noise assessment will be undertaken in-accordance with BS 4142:2014 and that the plant noise rating level limit at the worst-affected noise sensitive receptor will be assessed against the existing background noise levels, $L_{A90,T}$.

In line with BS 4142: 2014, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty will be subtracted from any of the above proposed noise emission limits.

4.2 Summary of Criteria

In summary of the criteria requirements above, if the targeted rating level from noise is equal or below the existing background noise, then the design criteria will be achieved.

5.0 PLANT NOISE IMPACT ASSESSMENT

Our assessment has been based on the following information.

5.1 Noise Sensitive Receivers

The noise impact generated by the new plant installation has been assessed at the worst affected NSR's which are described in Section 2.1 of this report.

5.2 Items of Noise Generating Plant

Information on the proposed plant installations have been provided by KJ Tait M&E engineers. The items of plant within each group, along with their locations and operational hours are as follows:

Reference	Type of Source	Manufacturer/ model	Location
ASHP	Air Source Heat Pump	Mitsubishi PURY-EP1100 YSN	External plant area
MVHR	Mechanical Ventilation Heat Recovery	Ground Floor: Nuaire XBOXER XBC+ 45 First Floor: Mitsubishi LGH80RVX / LGH100RVX	Internally located, ducted to atmosphere
GE	Gym Extract AHU	Nuaire (Dave) DE7	Internally located, ducted to atmosphere
TE	Toilet Extract	Nuaire (Dave) DE2H	Internally located, ducted to atmosphere
KEF	Kitchen Extract Fan	Nuaire AX40AW-28	Internally located, ducted to atmosphere

Table 5.1: Proposed items of noise generating plant

5.3 Operational Hours

MACH have not been informed of the operational hours of the plant. It is assumed that they will only be operational during the facilities use, therefore have only been assessed against the daytime levels (07:00 – 23:00). If plant items are to be utilised outside of the daytime period, MACH should be informed.

5.4 Plant Noise Data

The following noise levels for the individual items of plant are presented below. All data is based on manufacturers data. All plant noise data sheets are included within APPENDIX C.

Unit Reference	Noise Data Type	Duty Rate	Sound Levels, dB, at Octave Band Centre Frequencies, Hz								
			63	125	250	500	1k	2k	4k	8k	dB(A)
ASHP	SPL @ 1m	100%	81	71	74	72	66	64	59	57	73
MVHR (GF Nuair XBOXER XBC+ 45)	Intake - In-duct SWL	100%	83	75	75	64	64	62	54	45	71
	Exhaust - In-duct SWL	100%	88	81	85	71	72	72	66	64	80
MVHR (FF LGH80RVX)	SPL @ 1.5m (1)	100%	51	44	37	34	29	24	17	8	36
MVHR (FF LGH100RVX)	SPL @ 1.5m (1)	100%	53	45	39	36	32	25	18	7	38
GE	Exhaust - In-duct SWL	100%	96	91	75	71	68	63	59	55	78
TE	Exhaust - In-duct SWL	100%	81	74	74	68	67	66	62	64	73
KE	Exhaust - In-duct SWL (2) (3)	100%	-	79	73	69	66	63	62	-	72

Table 5.2: Plant equipment data

5.4.1 Data Assumptions

- (1) The MVHR data provided does not detail noise levels for case breakout, inlet, and outlet noise independently. Therefore there is risk that the noise levels included in this assessment are not representative of the inlet and outlet noise that would be present at the external duct terminations. Confirmation of the suitability of the available data should be provided by the manufacturer to confirm accuracy of this assessment. Additional attenuation may be required if the resultant noise levels exceed the proposed targets at the nearby noise sensitive receivers.
- (2) Only single figure noise data have been provided and thus spectral noise data was not available to be assessed. The data used for the assessment assumes an equivalent NR spectral curve to the single value dB(A) value. This is seen to be representative of the worst-case noise data, but confirmation of the correct data should be provided by the manufacturer.
- (3) The proposed units for kitchen extract are domestic units, therefore detailed data is not available. The data used in the assessment is considered representative of the worst-case noise data, and should act as a limit for the final product selection.

5.5 3D Acoustic Model

A 3D acoustic model of the development has been constructed in CadnaA such to accurately predict noise break out from individual items of plant from the development at nearby noise sensitive receivers. CadnaA is an industry standard noise modelling software which calculates how sound travels over distance. The model considers reflections off hard surfaces, ground absorption, acoustic screening, and geometrical spreading. The calculations are performed in accordance with ISO 9613: Attenuation of sound during propagation outdoors.

The following assumptions have been made in the model, based on observation of the site and proposed development has identified the following features. These features will be included within the calculation model including any other additional parameters stated.

- Ground absorption has been set to acoustically hard.
- Noise contour height is 1.6 m above ground, which is considered representative of the noise sensitive receivers.
- Topography of the site is assumed to be flat.
- Order of reflections has been set to 3.

A screenshot of the 3D noise model is illustrated below.



Figure 5.1: 3D Acoustic model with noise sources

5.6 Noise Impact Assessment (Proposed Installation)

The table below provides the calculated rating levels at the worst-affected noise sensitive receptors. The resultant noise map which calculated the combined specific noise level at each receiver is presented below.



Figure 5.2 - Noise impact assessment noise map (proposed installation)

NSR Reference	Time Period	Background Noise Level (dB L _{A90,T})	Criteria	Specific Noise Level (dB L _{Aeq,T})	Feature Correction	Rating Level (dB L _{A,r,T,r})	Assessment Outcome (dB)
NSR 1	07:00–23:00	38	Equal to background	45	-	45	+7
NSR 2	07:00–23:00	38	Equal to background	60	-	60	+22

Table 5.3: BS4142 assessment outcome

The current proposals show that noise levels assessed at the worst affected NSR exceed the proposed criteria significantly. As such, noise mitigation should be incorporated in the design to achieve compliance.

Noise mitigation strategy recommendations are presented in the following section.

5.6.1 Acoustic Feature Correction

5.6.1.1 Intermittency

The proposed plant units are not seen to be intermittently operating. Therefore, the acoustic feature correction for intermittency has not been applied.

5.6.1.2 Tonality

The tonality of the proposed M&E items could not be assessed as third octave noise data is required for the assessment and only octave/single-figure noise data was available at the time of writing. However, the proposed M&E items are typically broadband in character.

5.7 Acoustic Mitigation Strategy

5.7.1 In-duct Attenuators

Our assessment shows the ducted systems require in-duct attenuation. The following table presents the minimum insertion loss values these should achieve.

Unit Reference	Location	Minimum Insertion Loss, dB at Octave-band Frequency, Hz							
		63	125	250	500	1k	2k	4k	8k
MVHR	Intake & Exhaust Ducts	10	15	24	33	36	33	22	15
KE	Exhaust Duct	10	15	24	33	35	30	22	15
GE	Exhaust Duct	8	15	21	27	32	30	22	15
TE	Exhaust Duct	6	11	18	25	30	28	22	15

Table 5.4: Minimum required in-duct attenuator insertion losses

5.7.2 Attenuation Kit

Our assessment shows the ASHP units produce a high level of breakout noise which exceeds the targeted criteria. Therefore, MACH proposes to install attenuation kits to all of the intended units. The table below provides proposed attenuation insertion loss values.

Attenuator Location	Insertion Loss (dB)						
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
ASHPs	3	5	6	6	8	9	8

Table 5.5: Proposed Attenuation Insertion Losses

Please note the values above have been taken from a figure in the manufacturers literature as shown in Section C.1.1 of APPENDIX C and therefore are indicative only. These figures should be confirmed as being achievable by the manufacturer.

5.7.3 Acoustic Screening

Our assessment shows acoustic screening will be required, as outlined below:



Figure 5.3: Proposed acoustic screens (red)

Where acoustic screens have been specified these should meet the following specification:

- Be a solid construction.
- Have no gaps between the floor and the acoustic screen (or between the screen and the development if not entirely enclosed by the screen).
- Must be non-permeable and thus have no gaps within the acoustic barrier.
- Have a surface mass of $\geq 12\text{kg/m}^2$. Typical suitable materials include 10mm cement particle board, 2mm sheet steel or 18mm plywood.

5.8 Noise Impact Assessment (Post-mitigation)

A noise map which shows the cumulative specific noise level at each NSR is presented below. Each image below represents the relevant operational time of the plant equipment.



Figure 5.4: Plant noise prediction at nearest noise sensitive receivers

The table below provides the predicted plant noise rating level at the worst affected noise sensitive receptors, with the mitigation strategies implemented.

NSR Reference	Time Period	Background Noise Level (dB L _{A90,T})	Criteria	Specific Noise Level (dB L _{Aeq,T})	Feature Correction	Rating Level (dB L _{A,r,T,r})	Assessment Outcome (dB)
NSR 1	07:00–23:00	38	Equal to background	35	-	35	-3
NSR 2	07:00–23:00	38	Equal to background	38	-	38	±0

Table 5.6: Plant Noise Assessment Outcome

As can be seen in Table 5.6, providing that all the recommended mitigation strategies are incorporated in the design of the building services installation, the cumulative noise levels generated by the plant equipment are compliant with the design criteria.

5.9 Vibration Control

Although not necessarily related to planning matters, It is also important to consider the potential transfer of structure borne noise to the development itself, in the form of vibration.

It is typically recommended that condenser units and fans or anything generating vibration are isolated from the supporting structure by either steel spring isolators or rubber footings. Where there are particularly sensitive locations nearby, or when equipment is mounted on lightweight structures, consideration to use caged restrained type anti-vibration mounts should be made.

In addition, it is critical that the isolation is not “short-circuited” by associated ductwork or pipework. As such, flexible connectors should be introduced between the plant and any associated pipework or ductwork. Associated pipework and ductwork should be resiliently mounted, as appropriate.

5.10 Uncertainty

Consideration of the potential uncertainties involved in the sound level measurements and the assessment methodology have been made to ensure a high level of confidence in the outcome of the assessment. Annex B of BS4142:2014 presents a range of factors and good practice methods which should be made, and these have been considered in this assessment.

6.0 CONCLUSION

In summary the following points set out the conclusions of this report.

- A noise survey has been conducted at the proposed site to establish representative background noise levels (L_{A90}) at the nearby noise sensitive receivers. These background noise levels are presented in Section 3.0 of this report and the details of the noise survey itself are included in APPENDIX A.
- The assessment criteria to be used for the purpose of planning submission has been established and is provided in Section 4.0.
- Details of the plant equipment have been provided to us, including location and noise data, which has been presented in Sections 5.2, 5.3 and 5.4 of this report (fuller details in APPENDIX C & D).
- Calculations have shown that the criteria for the purpose of planning submission have not been achieved and further acoustic mitigation will be required. The suggested mitigation strategy is provided in Section 5.7.
- Calculations have shown that if the suggested mitigation measures shown in Section 5.7 are implemented, the proposed criteria for noise limits are achieved.

APPENDIX A ENVIRONMENTAL NOISE SURVEY

To establish the existing environmental noise levels on site, a noise survey was conducted between 12:40 on the 25/08/2022 and 12:40 on the 26/08/2022.

This site assessment was undertaken by Chase Bartlett of MACH Group.

A.1 Site Description

The site is located at B10 Bruce Grove, London N17 6RA and is situated in a dense urban residential area. Bruce Grove railway station can be found approximately 200m East of site. The A10 (Bruce Grove) sits adjacent to the site.

A.1.1 Subjective Noise Climate (On-site)

Noise Type	Noise Characteristics	Sources
Dominant	A primary contributor of noise levels on the site.	Road traffic from the A10
Other Noise Contributions	Contributors to the remainder of the noise climate on site.	Noise contributions from users of the youth centre.

Table A.1.1 - Subjective Summary of the Noise Sources

A.1.2 Non-Representative Noise Sources

During the survey, no noise events occurred which would be deemed as atypical of the site location.

A.2 All Measurement Locations

To help with the understanding of the site and measurement locations all the measurement positions are presented on the map below. Photos of the locations in situ are in the following sections.



Figure A.2 - All Measurement Locations on a Map

A.3 Fixed Measurement

A fixed microphone position was used to record noise levels between 12:40 on the 25/08/2022 and 12:40 on the 26/08/2022 where the fixed long-term meter was set to measure consecutive 'A' weighted 5-minute time samples. Measurements have been taken in free field conditions.

To help with the understanding of the site and the measurement locations, the figures below present the location of the microphone position(s) in situ. The results of the environmental noise survey are provided within section A.3.2.

A.3.1 Fixed measurement Location – F1



Figure A.3.1 - Fixed Measurement location in situ

A.3.2 Fixed Measurement Results

The following graph presents the levels recorded over the measurement period at the fixed location (F1).

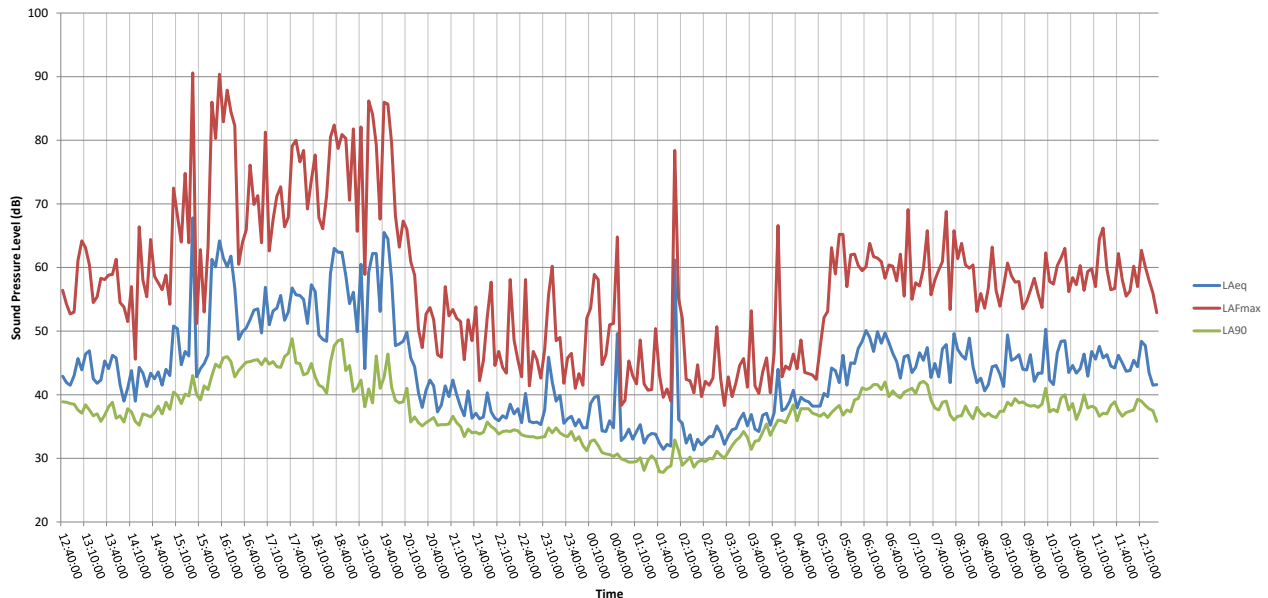


Figure A.3.2 - Sound Pressure Level at fixed location, F1

A.4 Measurement Equipment

Item	Serial No.	Last Calibration	Certificate No.	Calibration Due
NTI Precision Sound Analyser XL2 TA	A2A-11002-E0	Apr-21	155403	Apr-23
NTI Pre-amplifier MA220	7183	Apr-21	155403	Apr-23
Cirrus Microphone Capsule MK:224	214341A	Apr-21	155398	Apr-23
Svantek Acoustic Calibrator SV33A	64138	Oct-21	164975	Oct-22

Table A.4 - Measurement Equipment

A.5 Meteorological Conditions

Data Taken from: <https://www.timeanddate.com/weather/>

Date	Time (hh:mm)	Temperature (High / Low) (°C)	Humidity (%)	Pressure (hPa)	Wind Speed (m/s)	Wind Direction	Conditions
25/08/2022	12:00	21/19	84	1018	9	N	Broken clouds
	18:00	19/15	83	1019	4	N	Clear
26/08/2022	00:00	14/11	96	1018	1	NW	Fog
	06:00	22/11	75	1020	3	SW	Clouds
	12:00	25/22	45	1019	5	W	Sunny

Table A.5 - Meteorological Conditions

APPENDIX B LA90 HISTOGRAMS

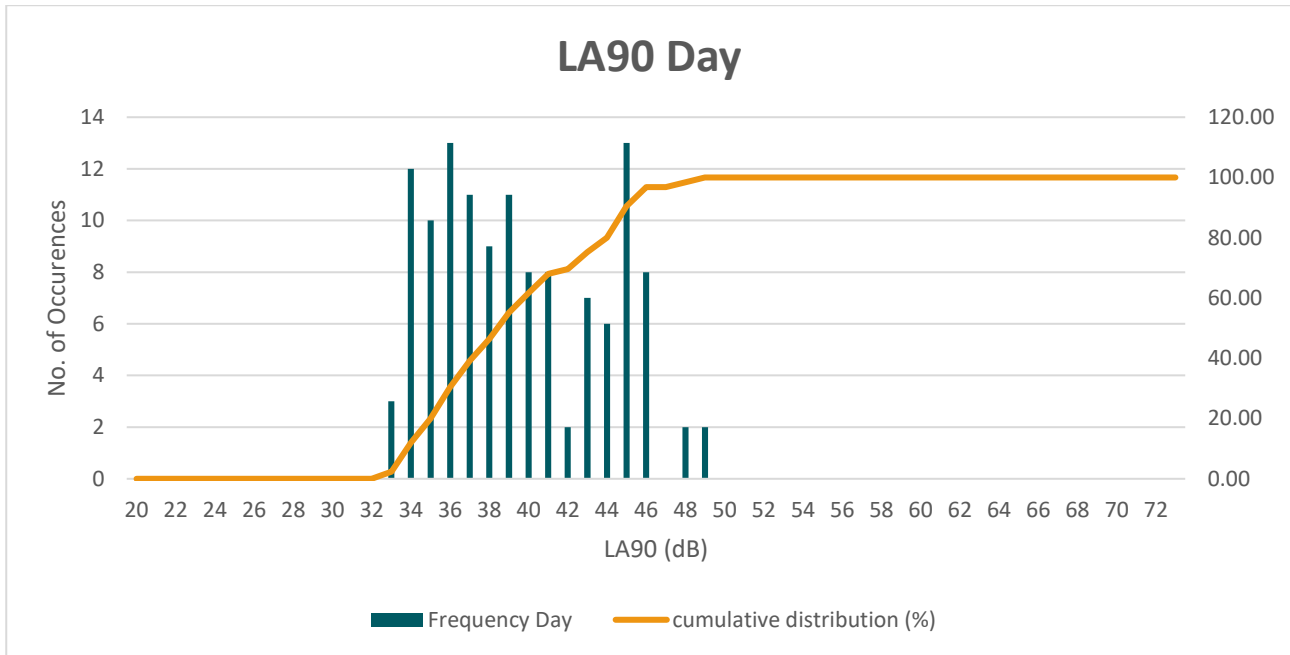


Figure 6.1 - Daytime LA₉₀ Histogram

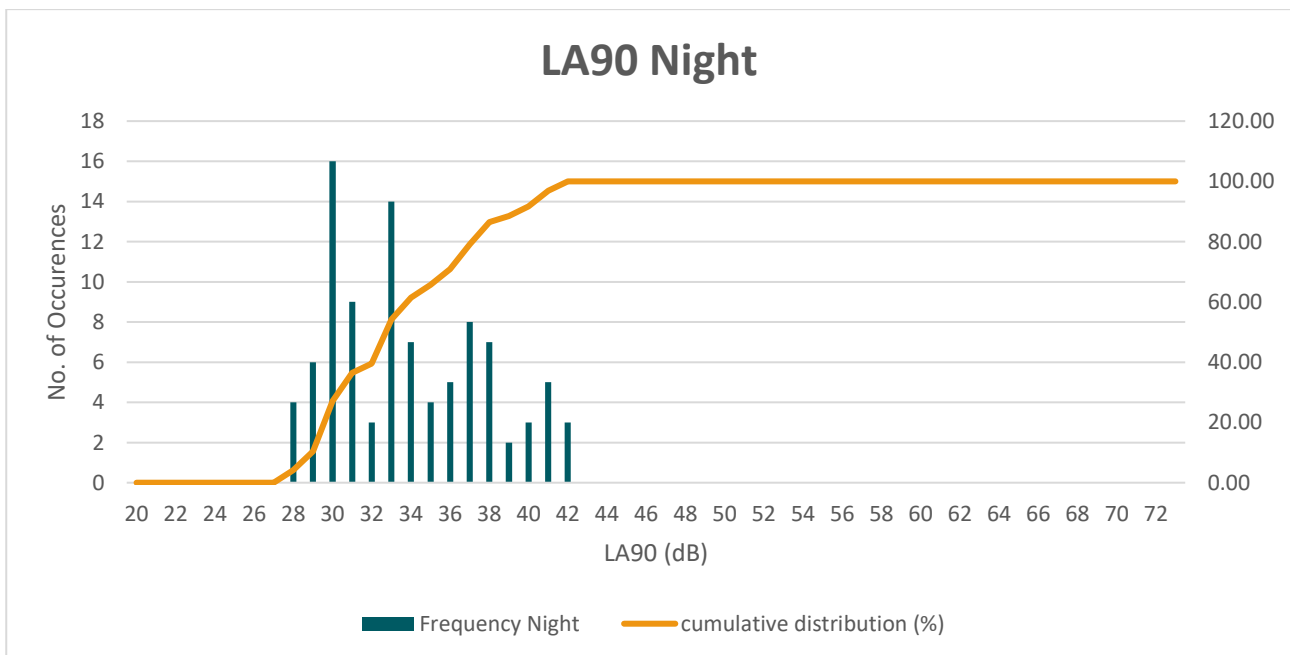
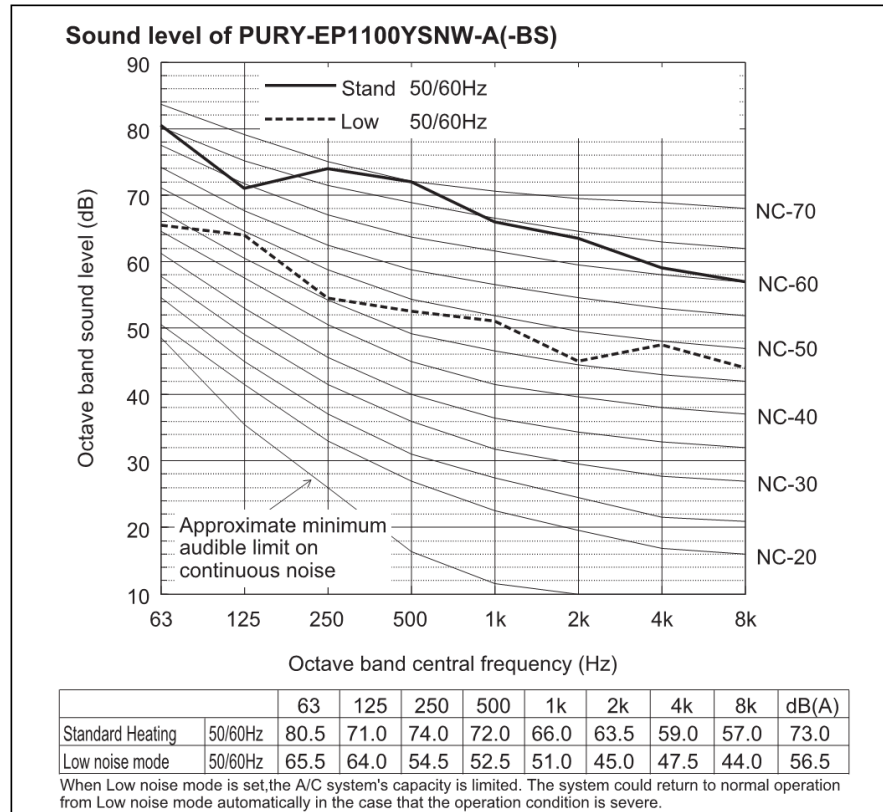


Figure 6.2 - Night-time LA₉₀ Histogram

APPENDIX C PLANT NOISE DATA

C.1 ASHP Spectral Data



C.1.1 Attenuation Kit

TYPES OF KIT

Both a 'full kit' and 'top only' kit are available. The 'full kit' comprises left, right and back louvres with a top attenuator. The 'top only' has a top attenuator only.

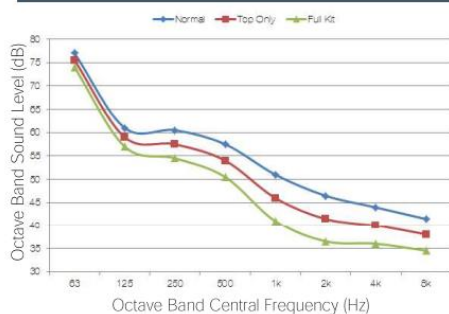
If space is an issue, then the 'top only' kit is available which can still reduce the noise level by up to 4dBA.

The noise level is calculated from an average of the noise at a height of 1m and distance of 1m from the front, back, left, right and 1m above the top. All noise measurements are performed in an anechoic chamber.

BASIC ACOUSTIC KIT COSTS



PURY-EP200YNW-A ACOUSTIC NOISE LEVEL DATA*



* Indication only

For all PUHY and PURY Series (YNN)

3 models are available, small, large and extra large. Small fits on the S-module outdoor units, large fits on the L-module outdoor units and extra large on the XL-module outdoor units.

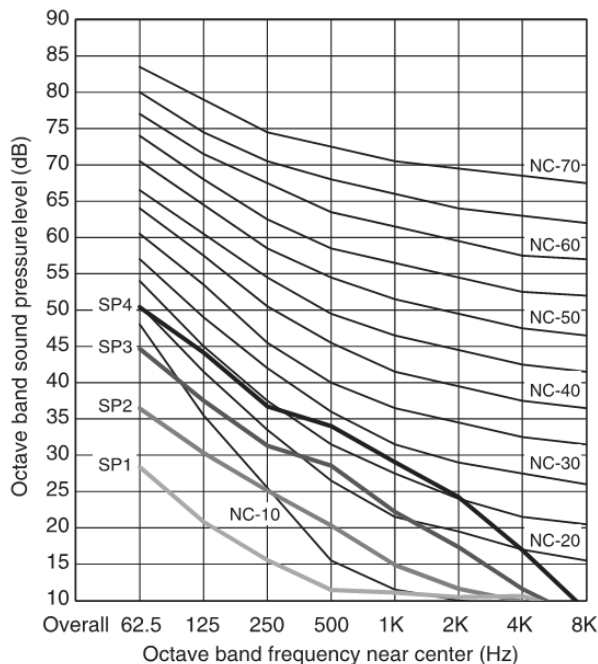
S-module	Complete acoustic kit target price	£2495.00
	Top attenuator only target price	£889.00
L-module	Complete acoustic kit target price	£2930.00
	Top attenuator only target price	£1208.00
XL-module	Complete acoustic kit target price	£3835.00
	Top attenuator only target price	£1778.00

All costs include delivery to England & Wales. Scotland shipping costs vary - please contact us for more info.

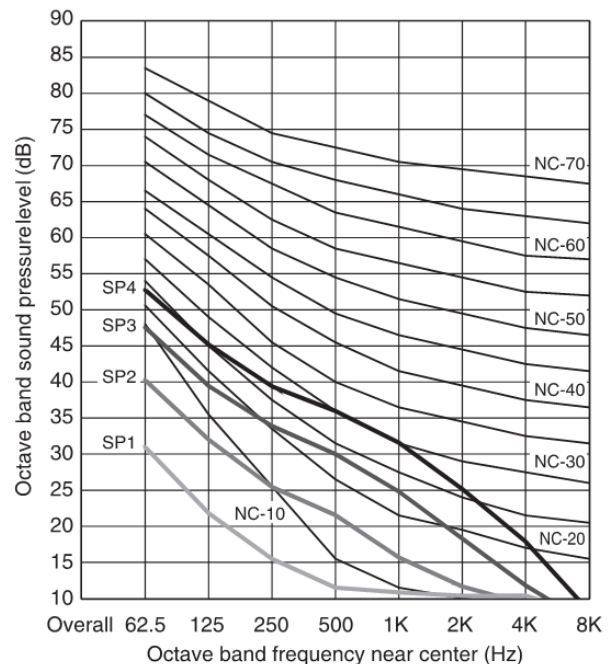
C.2 MVHR (GF Nuaire XBOXER XBC+ 45)

FAN SPEED	SOUND POWER LEVELS (db re 1 pW)	FREQUENCY (Hz)								SPHERICAL dBA @ 3m
		63	125	250	500	1K	2K	4K	8K	
100%	Induct Intake	83	75	75	64	64	62	54	45	35
	Induct Supply	87	80	85	71	72	71	66	62	
	Induct Discharge	88	81	85	71	72	72	66	64	
	Induct Extract	84	75	76	63	64	63	53	44	
	Casing Radiated	74	65	62	47	45	44	40	29	

C.3 MVHR (FF LGH80RVX / LGH100RVX)



LGH80RVX



LGH100RVX

C.4 Gym Extract

EXTRACT FAN SIZE DE7 - SOUND DATA

Unit Code		Sound Power Levels dB re 1pW								Breakout dBA @ 100% @ 3m	LwA	Breakout dBA @ 75% @ 3m	Breakout dBA @ 50% @ 3m
		63	125	250	500	1K	2K	4K	8K				
DE7-ES	Induct Inlet	87	93	80	72	67	65	62	62	42	79	36	27
	Induct Outlet	96	91	75	71	68	63	59	55		78		
	Breakout	75	72	69	57	55	45	40	37		63		
DE7A-ES	Induct Inlet	84	88	73	66	58	58	54	55	38	74	32	23
	Induct Outlet	91	88	75	69	67	62	58	54		75		
	Breakout	71	68	65	52	49	41	35	34		59		

C.5 Toilet Extract

EXTRACT FAN SIZE DE2H - SOUND DATA

Unit Code		Sound Power Levels dB re 1pW								Breakout dBA @ 100% @ 3m	LwA	Breakout dBA @ 75% @ 3m	Breakout dBA @ 50% @ 3m
		63	125	250	500	1K	2K	4K	8K				
DE2H-ES	Induct Inlet	77	73	69	71	62	61	61	66	30	72	24	<16
	Induct Outlet	81	74	74	68	67	66	62	64		73		
	Breakout	58	59	48	50	44	41	37	34		51		
DE2HA-ES	Induct Inlet	75	67	63	54	49	51	53	54	25	61	19	<16
	Induct Outlet	75	82	67	64	63	66	62	65		59		
	Breakout	53	60	42	40	36	36	33	29		46		

C.6 Kitchen Extract

Noise Level (External Venting)

Flat Hood

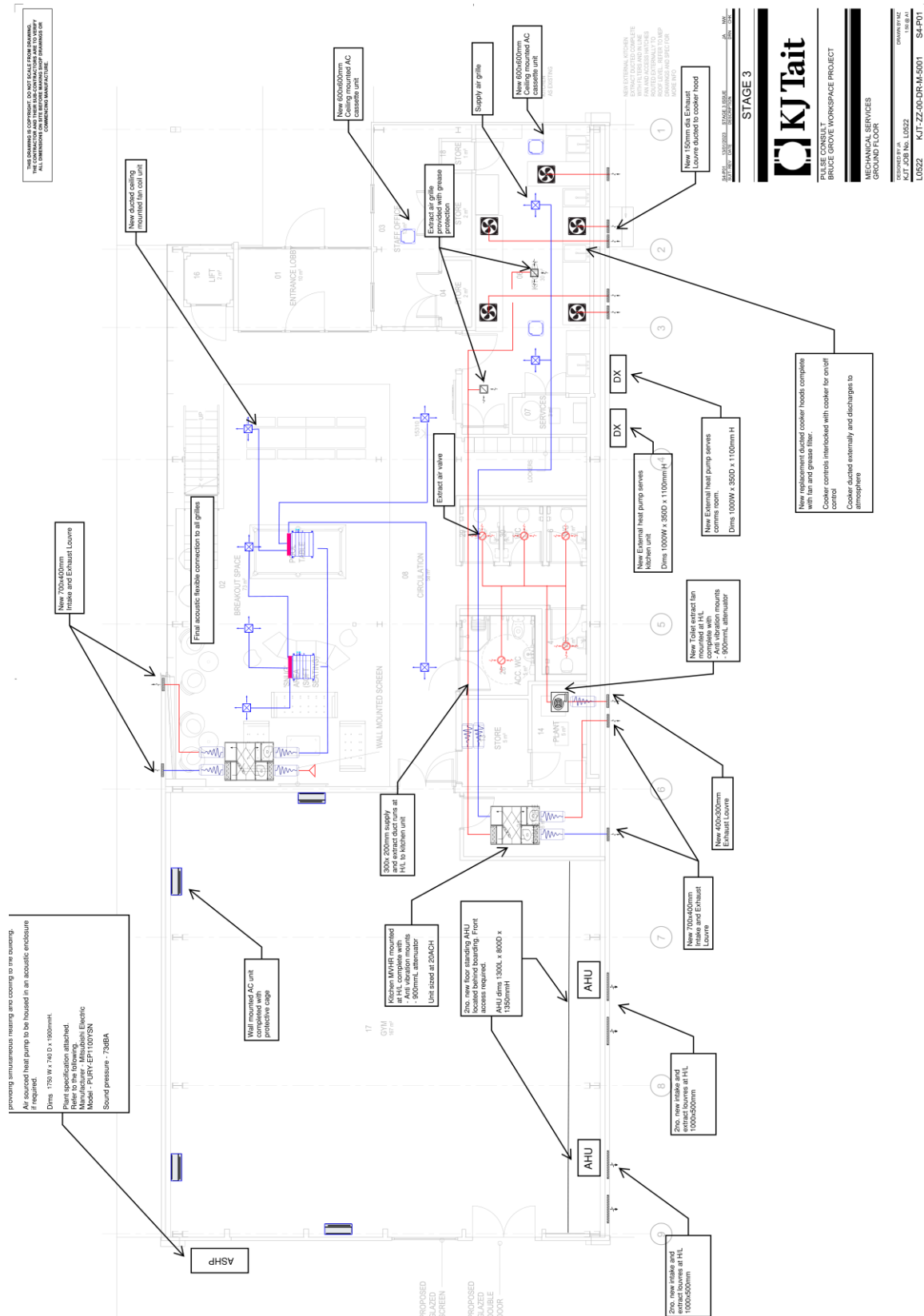
Booster	72 dBA
Position 3	65 dBA
Position 1	51 dBA

Chimney Hood

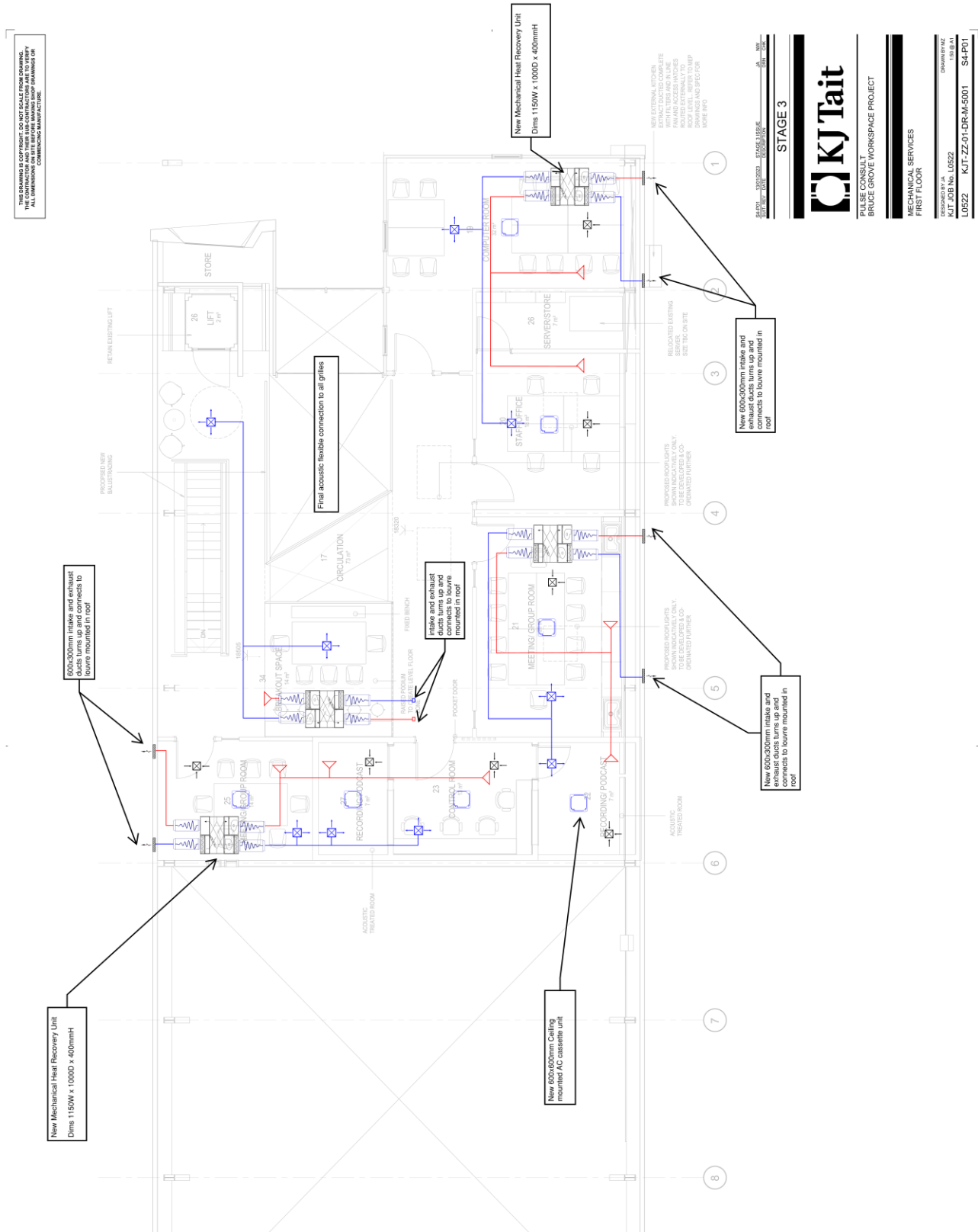
Booster	72 dBA
Position 3	65 dBA
Position 1	51 dBA

APPENDIX D PLANT LAYOUTS

D.1 Ground Floor



D.2 First Floor



APPENDIX E BS 4142:2014

BS 4142:2014 “Methods for rating and assessing industrial and commercial sound” describes a method of determining the level of noise of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. As such, an assessment to BS 4142 is typically called for within planning conditions. The likelihood of complaints in response to a noise depends on various factors. BS 4142 assesses the likelihood of complaints by considering the margin by which the noise in question exceeds the background noise level.

BS 4142 states that one should ‘obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The aforementioned rating level is based upon the specific noise level of the noise source in question. A correction should be applied to the specific noise level to obtain an increased rating level if ‘a tone, impulse or other characteristic occurs, or is expected to be present, for new or modified sound sources. To summarise, BS4142 Section 9.2 advises the following with regards to corrections for acoustic characteristics:

- **Tonality** – for sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.
- **Impulsivity** – A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.
- **Other sound characteristics** – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied
- **Intermittency** – When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.